

### REMARKS

This is in full and timely response to the above-identified Office Action. The above listing of the claims supersedes any previous listing. Favorable reexamination and reconsideration is respectfully requested in view of the preceding amendments and the following remarks.

#### Claim Objections

The claims have been reviewed and clarifying amendments have been made essentially in accordance with the Examiner's suggestions.

#### Rejections under 35 USC § 112

In this response, the claims have been reviewed and rendered clear and definite by the removal of the expression "said single pack or two pack ink" from claim 1.

#### Claim Interpretation

In this response, the preambles of the claims have been revised to call for a liquid thermosetting ink-jet ink. This recitation is deemed to worthy of patentable weight in that it calls for a liquid thermosetting ink-jet ink as different from an ink "for inkjet applications." This shifts the burden to show that the prior art would suggest a liquid thermosetting ink-jet ink to the hypothetical person of ordinary skill as different from simply an ink which may be used for inkjet printing.

It is submitted that in accordance with MPEP 2111.02 that the preamble now breathes life and meaning into the claims. For example, in *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951), a preamble reciting "An abrasive article" was deemed essential to point out the invention defined by claims to an article comprising abrasive grains and a hardened binder and the process of making it. The court took the position that "it is only by that phrase that it can be known that the subject matter defined by the claims is comprised as an abrasive article. Every union of substances capable *inter alia* of use as abrasive grains and a binder is not an `abrasive

article.' " Id. at 481, 187 F.2d at 152. Therefore, the preamble served to further define the structure of the article produced. The situation here is respectfully submitted as being analogous.

#### Rejections under 35 USC § 103

The rejection of claims 1-12 and 18 under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Masse et al. U. S. Patent 5,478,885 (hereinafter Masse), in view of Muroi et al. U.S. Patent 5,480,957 (hereinafter Muroi), and Hopper et al. Pub. No. US 2006/0047014 (hereinafter Hopper), is respectfully traversed.

In this response claim 1 has been amended to include the subject matter of claim 3 and to set forth "a thermosetting ink-jet ink; wherein the ink is characterized by a viscosity lower than 50 Cps at application temperature; a surface tension lower than 80 dyne/cm at application temperature; and, a glass transition temperature of said ink, in a cured form, being greater than 120 °C, and wherein it comprises: (a) one or more epoxy resins;(b) at least one solid latent curing agent characterized by a maximal particle size of less than 2 microns selected from urea derivatives, imidazoles, dicyandiamide, inorganic boron salts, their precursors and/or any mixture thereof."

This amendment removes the recital of modified amines from the group of latent curing agents.

It is submitted that there are a number of parameters that influence inkjet printing, especially in connection with the print head. Among these parameters are the maximal particle size, the latency and the operating temperature range. The primary function of the print head is to eject individual drops of material such that the final size and position of the dot on the substrate is predictable. Particle having size of more than about 2 microns can not be use for ink-jet applications inasmuch as it causes obstruction of the print head. It is submitted that there are no commercially available latent curing agents having size less that 2 microns.

DICY has a low solubility and once having its size reduced to less than 2

microns, it becomes a very effective latent curing agent for ink-jetable epoxy, even when the ink contains solvents and monomers, such as acrylic and methacrylic compositions. DICY cures epoxy to very high Tg values and much alike aromatic amines and anhydride curing agents, it is characterized by excellent chemical and physical properties suitable for solder masks. DICY is commercially available as a pulverized powder. However, the finest powders available have an average particle size of about 6 microns and thus are excluded from use in ink jet inks.

In order to be applied in ink-jet inks, DICY should be reduced to maximal particle size of less than 2 micron, and more preferably less than 700 nanometer, wherein the particles are stable in a manner that their aggregation or agglomeration is avoided.

Furthermore, for inkjet application the latency of the ink should exhibit a viscosity change of at most 5 Cp at a shear rate of 10 to 100,000 1/sec during ambient storage for at least 3 months. This latency is essential for inkjet applications.

The Applicant respectfully agrees with the Examiner analysis regarding acknowledged shortcomings of MASSE and that this reference fails to teach: (A) wherein the curing agent is (1) at least one solid latent curing agent characterized by a maximal particle size of less than about 2 microns; (B) wherein the ink is characterized by: (1) a viscosity lower than 50 Cps at application temperature at shear rate of 0.1 to 100,000 1/s and (2) a viscosity lower than 20 Cps at application temperature; (C) wherein the ink is characterized by: (1) a surface tension lower than 80 dyne/cm at application temperature; a surface tension lower than 24 to 34 dyne/cm at application temperature; and, (D) wherein the cured ink features : (1&2) a glass transition temperature greater than 120°C.

Muroi discloses "*A curing agent for epoxy resins is prepared from an amine and an epoxy, as well as subsequent modification by a polyisocyanate compound, in such a manner that the curing agent is in the form of small spherical particles*".

The active component of the Muroi is the reactive product of amine and epoxy, while the instant application utilizes commercially available latent curing agents, namely DICY or imidazole derivatives. Moreover, the products disclosed by Muroi are provided

by salting-out from a solution comprising the epoxy resin and amine binder. Those respectively big matrices are subjected to milling so that a submicron final product is obtained. Nevertheless, the milling negatively affects the particles activity.

If the hypothetical person of ordinary skill were, as suggested by the Examiner, use the process disclosed in Muroi with latent curing agents namely DICY or imidazole derivatives, the particles obtained would be shaped as long needles. Such particles causing printing head obstruction are definitely not appropriate for inkjet application.

The instant application, however, pertains to a novel technology in which catalyze particles are precipitated on top the in-organic carrier, being of average diameter lower than 2  $\mu\text{m}$ .

Muroi relates to submicron homogeneous curing adducts of amine and epoxy. Those latent curing agents are significantly less effective after their milling, and their effectiveness is undesirably deteriorated at relatively low temperature, while the instant application defines heterogeneous latent curing agents, which are not sized by milling, reacting at significantly higher temperatures.

Furthermore, the latency of the reactive product comprising amine and epoxy as disclosed in Muroi are known in the art, and are not appropriate for inkjet application. For example, Ajicure information about latent curing agents and accelerators for epoxy resin have shown in that the viscosity increase ratio after four weeks is between 1.2 to 2.4.

While Hopper may discloses a viscosity of the ink being from 8 to 15cp at 40°C, it must be appreciated that the unique latency feature of the curing agent, especially adapted for inkjet application, without scarifying the requirements of the cured layer, is deposited as crystals on its surface, impregnated in its porosity, or dispersed as small crystals in a dispersing agent layer on or in the inert particle surfaces and constitutes a novel and inventive step. This unique feature enables the use of active components such as DICY and imidazole, along with their effective activity, in inkjet applications. The claimed subject matter therefore relates to a novel technology in which catalyzed particles are precipitated on top the in-organic carrier, and have an average diameter

lower than 2 $\mu$ m.

None of Masse, Muroi or Hopper shows or suggests a curing agent with the particular structure recited in the pending claims. The curing agent is a heterogeneous particle comprising at least one latent curing agent or its precursors and at least one kind of inert particle wherein the curing agent is layered on the surface of the inert particle, deposited as crystals on its surface, impregnated in its porosity, or dispersed as small crystals in a dispersing agent layer on/in the inert particle surfaces. In Masse, Muroi and Hopper the particles are entirely hard while the claims require the particles to be at least partially porous.

Therefore, for all of the above reasons, claims 1-22 are novel and do not lack an inventive step over Masse, in view of Muroi and Hopper.

Claims 13 and 14 were rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of MASSE, Muroi, and Hopper in view of JP 63-261253 (hereinafter '253). This rejection is rendered moot by the cancellation of claims 13 and 14.

#### Allowable Subject Matter/New Claims

The indication that claims 15-17 contain allowable subject matter is noted with appreciation. The subject matter of these claims is therefore presented in independent form in claims 34-36.

New claim 33 is presented for examination. This claim sets forth subject matter which is supported by original claims 1 and 23, and recites a method for producing a liquid thermosetting ink for ink-jet applications, comprising *inter alia* the steps of: (a) dissolving at least one solid latent curing agent or its precursors, characterized by fine particles in a solvent to form a clear solution; (b) admixing an inert filler having maximal particle size of 2 microns with the solution obtained above to form a homogenized dispersion; (c) precipitating said curing agent as a layer or in the form of small crystals onto said filler surface and/or inside the internal porosity of said filler. This claim sets forth subject matter which is neither disclosed in nor suggested by the art applied in this

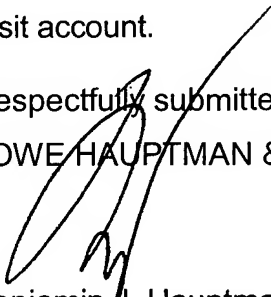
rejection.

Conclusion

It is respectfully submitted that the claims as they have been amended are allowable over the art which has been applied in this Office Action. Favorable reconsideration and allowance of these claims along with those newly presented in this response, are courteously solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,  
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